SANTA FE HEIGHTS
CEQA Drainage Study

County of San Diego, California

Prepared for

Starwood Santa Fe Partners
P.O Box 2504
Rancho Santa Fe, CA 92067

W.O. 2617-0001

December 7, 2011

Prepared by:

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Table of Contents

1. Introduction

1.1. Scope of Work

The work included in this study includes the following:

- Determine the existing and proposed condition flow rates for the 100-year storm event.
- Calculate the required size of proposed basins and outfall structures to accommodate the 100-year storm and to detain any increases in runoff due to the proposed development.

1.2. Project Description

The proposed project is located north of Artesian Road, south of Top of the Morning Way, and west of Caminito Del Vientecito within the County of San Diego. Refer to the project vicinity map located in **Appendix 1**.

According to the FEMA Flood Insurance Rate Map (FIRM) for this site, the project is located outside the 100-year flood hazard area in the unshaded Zone X of the FEMA Map, which is defined as "Areas determined to be outside the 500-year floodplain". Refer to the FIRM Map in **Appendix 1**.

Using information contained within the geotechnical report, the soil type for this project is confirmed to be silty clay, classified as Hydrologic Soil Group "D". Type "D" soils are described as a having very low infiltration rate. Refer to the report by Geocon, titled Geotechnical Investigation: Santa Fe Heights, for complete soils information.

1.3. Existing Condition

The project currently consists of 19.6 acres of a naturally vegetated hill. In the existing condition, runoff drains via sheet flow from a central high point to the project boundaries to the north, south, east, and west. An existing wall along the western boundary forces runoff to flow to the north and south from the high point of the boundary. Slopes from the central high point to project boundaries, range from 5% to 10%.

In existing conditions, runoff drains from the northern and southern portions of the site, primarily to a drainage ditch and Artesian Road, respectively. The northern and southern areas are further divided by a ridge creating four total sub-areas. For the purpose calculations, a Point of Concentration (POC) is assumed to occur at the corner of each drainage sub-area. Draining to the lined channel negates

The northern portion of the site is tributary to the San Diego River, approximately 0.5 miles to the northwest. The southern portion of the property is tributary to Lusardi Creek approximately 1 mile to the southwest, then the San Diego River.

1.4. Proposed Condition

The proposed development includes grading eight single family pads with a private road, a maintenance access road, and an internal storm drainage system.

Drainage patterns will remain the same as those in the existing condition, though ridgelines are shifted by the road and lots. Runoff originally crossing onto adjacent properties to the north east is captured by a swale and routed to the proposed basin and mitigated outlet facilities. Due to an existing block wall along the western boundary, no runoff drains to the western adjacent lots in existing conditions.

Runoff is routed to the four corners of the site through graded ditches and storm drains. At each corner, this report analyzes existing and proposed peak runoff and recommends detention basins to mitigate any increases in runoff.

The proposed basins for this project were designed in correlation with water quality and hydromodification requirements and will also provide mitigation in avoiding additional runoff to adjacent properties. These design criteria and methodologies are described in the Santa Fe Heights Major Stormwater Management Plan.

2. Methodology

2.1. Hydrology

The Rational Method as described in the June 2003 San Diego County Hydrology Manual (SDCHM), Section 3, was used for the hydrologic calculations for this project. The Rational Method formula is expressed as follows:

$Q = C\ I\ A$

$I = 7.44 P_6 T^{-0.645}$

$T = [1.8(1.1-C)\sqrt{D}] / (s^{1/3})$

Where:

Q = Peak discharge, in cubic feet per second (cfs).
C = Runoff coefficient, proportion of the rainfall that runs off the surface. The C coefficient was obtained from Table 3-1 of the SDCHM. It has no units and is based on the soil group and the development type for the drainage sub-area.
A = Drainage area contributing to the design location (ac).
I = Average rainfall intensity (in/hr). The formula can be found on Figure 3-2 of the SDCHM.
P_6 = 6-hour precipitation (in). This value was taken from the 6-hour isopluvial maps found in Appendix B of the SDCHM.
T = Time of concentration (min). The formula can be found on Figure 3-3 of the SDCHM.
D = Longest flow path distance (ft).
S = Slope along the flow path (%).

2.2. Hydraulics

In order to provide adequate flood control, any increases in peak flow rates at the outfall locations for this site were mitigated using extended detention basins. These basins were designed using RickRatHydro and Hydraflow Hydrographs version 6.052.

RickRatHydro was used to produce the hydrographs for each drainage subarea, based on the area, time of concentration, P_6 value, runoff coefficient, and peak flow rate.

The hydrograph for each subarea was then imported into Hydraflow Hydrographs and was routed through an iteration of basin stage/storage designs and outlet structures, until the resulting flow rate at the outfall was equal to or less than that during the existing condition at that point.

3. Results and Conclusions

The proposed basin design features from the Hydraflow Hydrographs results are listed in **Table 1**:

Table 1 Basin Design Specifications

	Basin 2	Basin 3	Basin 4
Total Depth (ft)	3.0	5.0	4.0
Riser Diameter (in)	6	4	6
Riser Height (ft)	2.5	4.5	3.5
Orifice Diameter (in)	1	0.5	1
Orifice Height (ft)	0.0	0.0	0.0

Results from the Rational Method calculations and from the Hydraflow Hydrographs basin mitigation calculations are shown in **Table 2**. These results show increases in the peak 100-year flow rate from areas 2, 3, and 4 from the existing to the proposed condition. The drainage area to Area 1 was reduced in the proposed condition, which reduced the peak flow rates to the outfall from this subarea.

The results show very little flow leaving each basin after mitigation. This is because, due to hydromodification requirements, the proposed basin volumes are very large, and the outlet structures are located at elevations higher than the 100-year ponding depth. The results for the Rational Method calculations are included in **Appendix 3**.

The outlet structures for both basins were designed to correlate with the water quality and hydromodification designs. The outlet structures and basin design criteria from the Hydraflow Hydrographs modeling results are included in **Appendix 4**.

Basin 3 will outlet through a proposed riser, which will connect to the existing drainage ditch along the northern boundary of the project. Basins 2 and 4 along the southern portion of the project will release runoff through a proposed riser, which will outlet through a proposed headwall, then onto a concrete apron, which will discharge onto Artesian Road.

These results show that the proposed development of this project will not increase peak flows for any point of discharge. This project will therefore not compromise the capacity of downstream drainage facilities.

Since the proposed flowrate to the Area 1 discharge point decreases, and the outlet flowrates from the three basins are either zero or minimal during the 100-year event, discharge velocities will also be either zero, minimal, or less than those in the existing condition. Therefore, impacts downstream due to erosion and sedimentation are expected to be minimal to none.

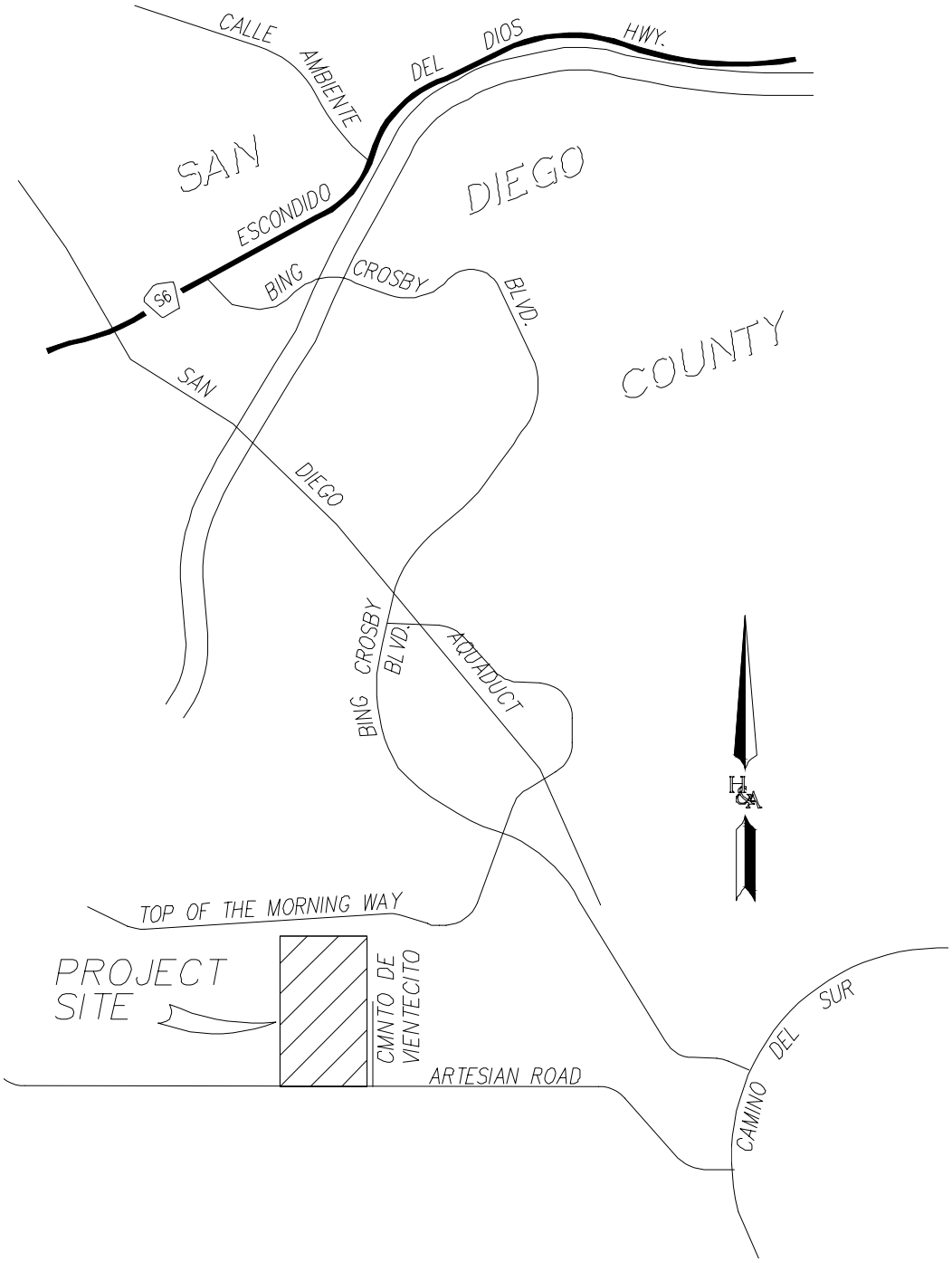
Table 2 Hydrology Calculations and Mitigation Results

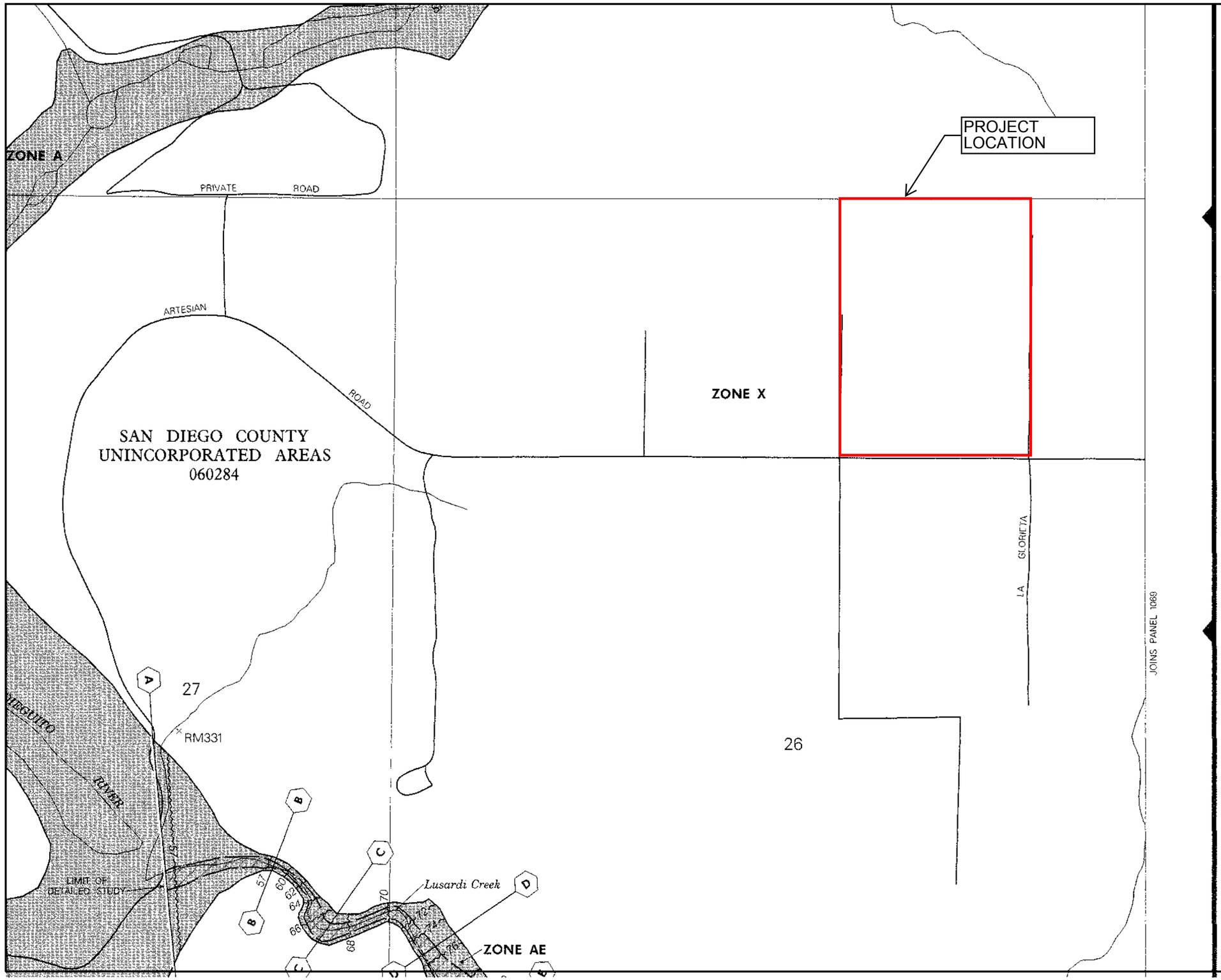
		AREA (AC)	RUNOFF C VALUE	Q_{85TH} (CFS)	Q_{100} (CFS)	Q_{100} AFTER MITIGATION (CFS)	V_{100} INTO BASIN (CU FT)	V_{85TH} INTO BASIN (CU FT)	TOTAL BASIN STORAGE VOLUME (CU FT)
EXISTING CONDITION	**AREA 1**	3.1	0.35	--	3.9	--	--	--	--
	AREA 2	5.7	0.35	--	5.2	--	--	--	--
	AREA 3	4.0	0.35	--	4.8	--	--	--	--
	AREA 4	6.8	0.35	**--**	6.7	**--**	**--**	**--**	**--**
PROPOSED CONDITION	**AREA 1**	2.9	0.37	0.08	3.6	3.6*	N/A	N/A	N/A
	AREA 2	5.2	0.41	0.2	6.1	0.014	21,780	2.338	26,763
	AREA 3	5.0	0.39	0.17	7.4	0.0	20,520	2,042	31,869
	AREA 4	6.5	0.40	0.24	7.8	0.0	26,664	2,841	43,087

* Mitigation not provided at this point.

4. Appendix

Appendix 1 – Vicinity Map and FIRM Map





APPROXIMATE SCALE IN FEET
500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1068 OF 2375
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, COUNTY, UNINCORPORATED AREAS	060284	1068	F
SAN DIEGO, CITY OF	060295	1068	F

MAP NUMBER
06073C1068 F

EFFECTIVE DATE:
JUNE 19, 1997

Federal Emergency Management Agency

Appendix 2 - Soils Information


117° 9' 42"
117° 9' 29"
484900
484950
485000
485050
485100
485150
485200
33° 1' 19"
33° 1' 4"
3653750
3653700
3653650
3653600
3653550
3653500
3653450
3653400
3653350
3653300
Top O the Morning Way
HrE2
HrC
Artesian Rd
Map Scale: 1:2,260 if printed on A size (8.5" x 11") sheet.
N
Meters
0 20 40 80 120
Feet
0 50 100 200 300

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:2,260 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 6, Dec 17, 2007

Date(s) aerial images were photographed: 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HrC	Huerhuero loam, 2 to 9 percent slopes	D	19.6	95.7%
HrE2	Huerhuero loam, 15 to 30 percent slopes, eroded	D	0.9	4.3%
Totals for Area of Interest			**20.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Appendix 3 –Hydrology Calculations and Exhibits

1 — Q_{100} = 3.9 cfs.; A = 3.1 ac.; T_c = 15.8 min.

2 — Q_{100} = 5.2 cfs.; A = 5.7 ac.; T_c = 26.4 min.

3 — Q_{100} = 4.8 cfs.; A = 4.0 ac.; T_c = 17.6 min.

4 — Q_{100} = 6.7 cfs.; A = 6.8 ac.; T_c = 23.5 min.

MAP NO. 14557

EXISTING TYPE D-75 DRAINAGE DITCH

TYPE D-75 ROW DITCH

MORNING WAY

TOP OF THE

ARTESIAN ROAD

APN 267-147-02

APN 267-147-01

APN 267-210-42

APN 267-210-40

APN 267-145-17

APN 267-145-18

APN 267-145-15

APN 267-145-16

LEGEND

DRAINAGE BOUNDARY

FLOWLINE

HYDROLOGY NODE — 3 — Q_{100} = 0.0 cfs.; A = 0.0 ac.; T_c = 0.0 min.

50 0 50 100 150

SCALE 1"=50'

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC.

PLANNING 5707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 - FX(858)558-1414

EXISTING CONDITION HYDROLOGY EXHIBIT FOR

SANTA FE HEIGHTS

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 1 OF 2

W.O.#

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SCALE 1"=50'

1 — Q_{100} = 3.6cfs. A= 2.9 ac. T_c =18.0 min.

2 — Q_{100} = 6.1cfs. A= 5.2 ac. T_c =22.3 min.

3 — Q_{100} = 7.4cfs. A= 5.0 ac. T_c =15.0 min.

4 — Q_{100} = 7.8cfs. A= 6.5 ac. T_c =21.7 min.

PROPOSED 20' TRAIL EASEMENT–SEE SHEET 3 FOR EASEMENT LOCATION

EXISTING TYPE D-75 DRAINAGE DITCH

46' GRADED SETBACK

AC DIKE PER S.D.R.S.D. G-5, TYPE E (TYP.)

CALLE MONTANA (PVT. BRK.)

ARTESIAN ROAD

THE MORNING WAY

TOP OF THE MORNING WAY

BASIN 2

BASIN 3

BASIN 4

EXISTING 24" R.C.P. DRAIN PER COUNTY DWG. NO. T.P.M. 19(

EXISTING 18" C.M.P. DRAIN PER COUNTY DWG. NO. T.P.M. 19(

EXIST. NORTHERLY

12' MAINTENANCE BASIN (14' GRADE COUNTY OF S.D.

PROPOSED PATHWAY & PATHWAY EASEMENT ALIGNED TO AVOID CONFLICT WITH EXISTING UTILITIES DESCRIBED BELOW

APN 267-147-02

APN 267-147-01

APN 267-210-39

APN 267-210-40

APN 267-210-42

APN 267-145-17

APN 267-145-18

APN 267-145-15

MAP NO. 14557

LEGEND

DRAINAGE BOUNDARY

FLOWLINE

HYDROLOGY NODE

3 — Q_{100} = 0.0cfs. A= 0.0 ac. T_c = 0.0 min.

PREPARED BY:

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PLANNING 9707 Waples Street
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SURVEYING PH(858)558-4500 · FX(858)558-1414

PROPOSED CONDITION HYDROLOGY EXHIBIT FOR

SANTA FE HEIGHTS

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 2 OF 2

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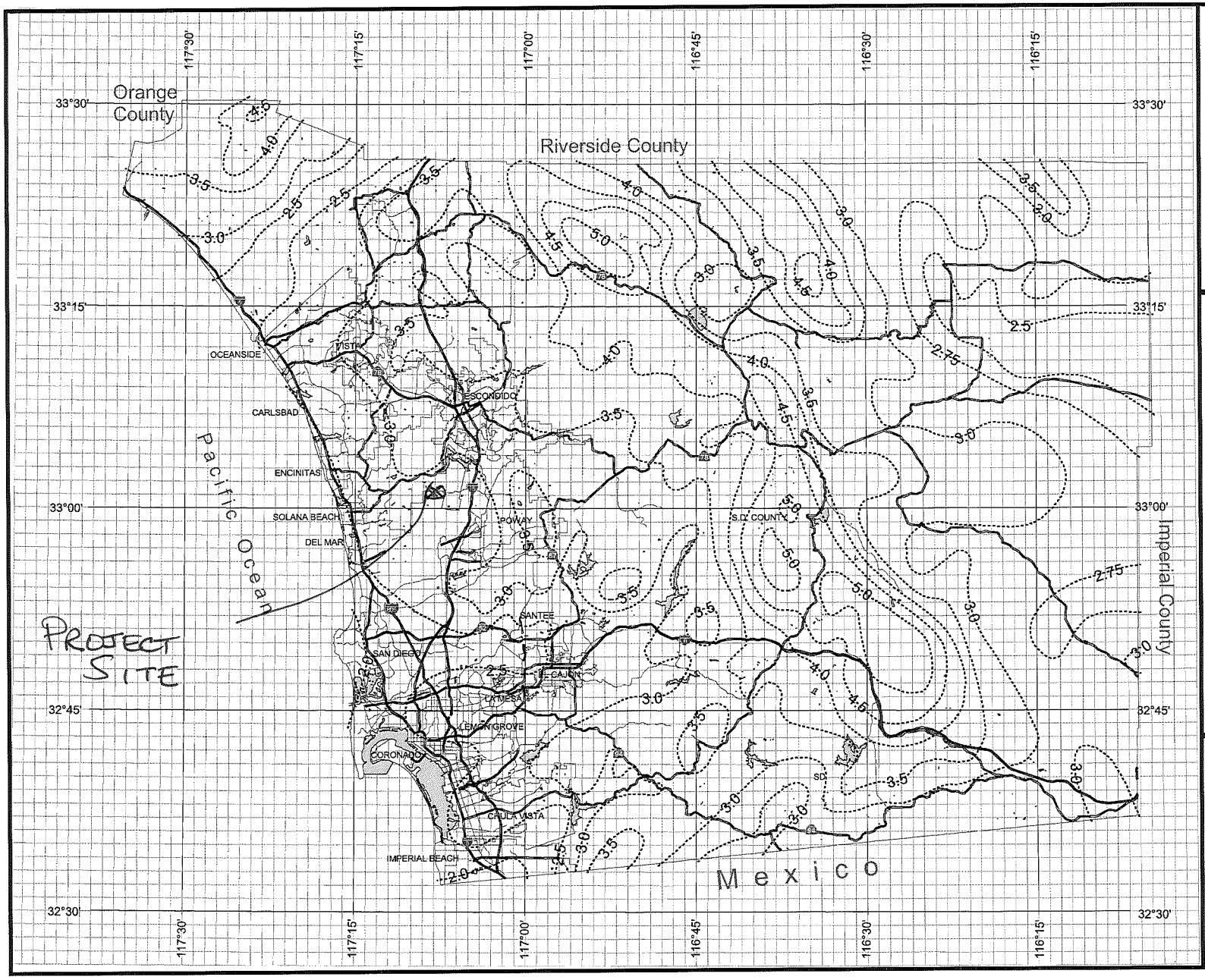


County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

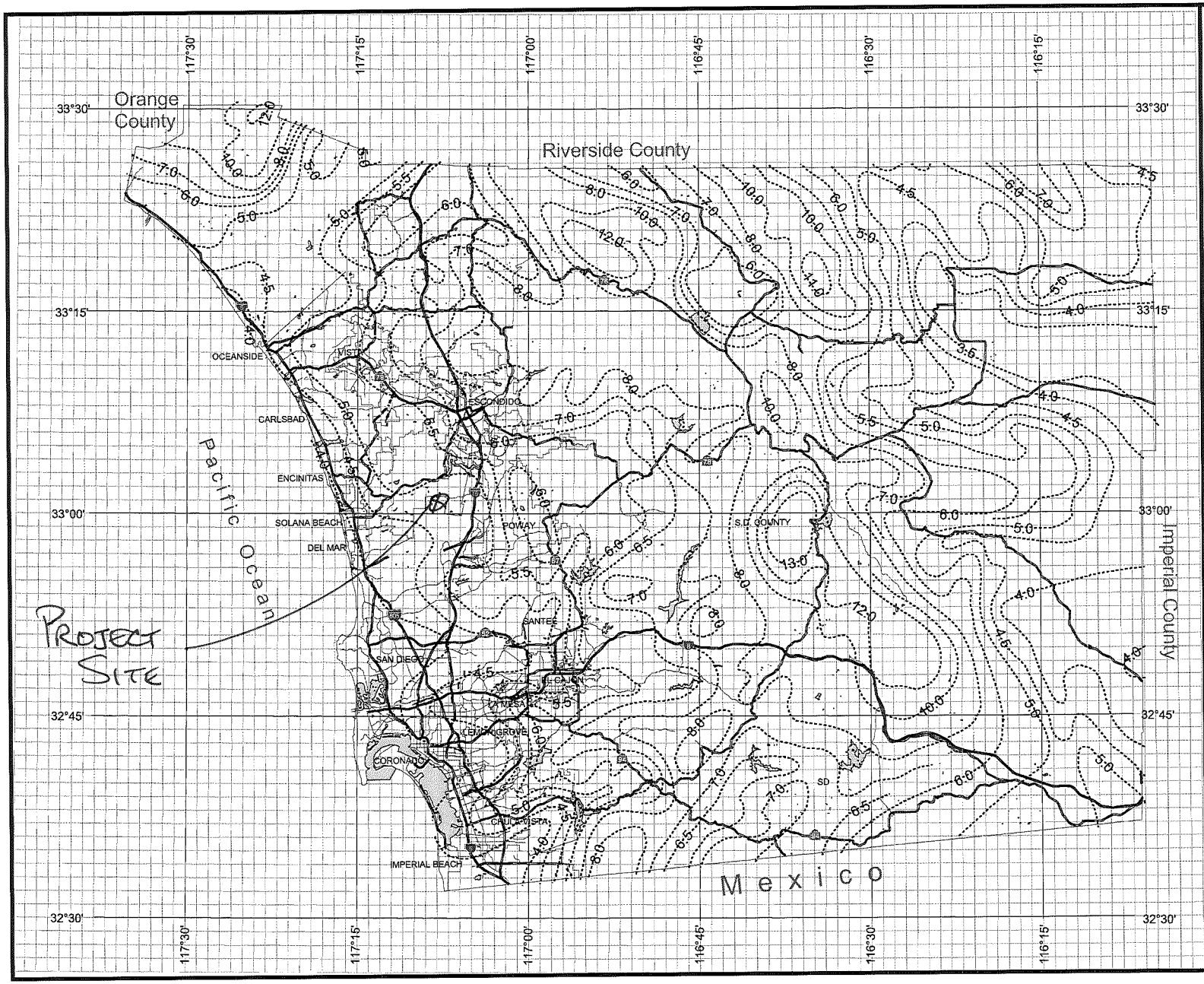
Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Systems

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

SANTA FE HEIGHTS
HYDROLOGY CALCULATIONS

FORMULAS

Runoff Coefficient C = 0.9 * (Impervious Fraction) + Cp * (1-Impervious Fraction)

Pervious Runoff Coefficient (Cp) From SDHM Table 3-1

EXISTING CONDITION

AREA 1		AREA 2		AREA 3		AREA 4	
RUNOFF COEFFICIENT (Cp)	0.35	RUNOFF COEFFICIENT (Cp)	0.35	RUNOFF COEFFICIENT (Cp)	0.35	RUNOFF COEFFICIENT (Cp)	0.35
AREA (AC)	3.1	AREA (AC)	5.7	AREA (AC)	4.0	AREA (AC)	6.8
INTENSITY (IN/HR)	3.6	INTENSITY (IN/HR)	2.6	INTENSITY (IN/HR)	3.4	INTENSITY (IN/HR)	2.8
P6 (IN)	2.9	P6 (IN)	2.9	P6 (IN)	2.9	P6 (IN)	2.9
Tc (MIN)	15.8	Tc (MIN)	26.4	Tc (MIN)	17.6	Tc (MIN)	23.5
FLOW LENGTH (FT)	620	FLOW LENGTH (FT)	930	FLOW LENGTH (FT)	608	FLOW LENGTH (FT)	863
SLOPE (%)	9.6	SLOPE (%)	3.8	SLOPE (%)	6.8	SLOPE (%)	4.8
Q100 (CFS)	3.9	Q100 (CFS)	5.2	Q100 (CFS)	4.8	Q100 (CFS)	6.7

PROPOSED CONDITION

AREA 1		AREA 2		AREA 3		AREA 4	
IMPERVIOUS FRACTION	0.03	IMPERVIOUS FRACTION	0.10	IMPERVIOUS FRACTION	0.08	IMPERVIOUS FRACTION	0.09
RUNOFF COEFFICIENT	0.37	RUNOFF COEFFICIENT	0.41	RUNOFF COEFFICIENT	0.39	RUNOFF COEFFICIENT	0.40
AREA (AC)	2.9	AREA (AC)	5.2	AREA (AC)	5.0	AREA (AC)	6.5
INTENSITY (IN/HR)	3.4	INTENSITY (IN/HR)	2.9	INTENSITY (IN/HR)	3.8	INTENSITY (IN/HR)	3.0
P6 (IN)	2.9	P6 (IN)	2.9	P6 (IN)	2.9	P6 (IN)	2.9
Tc (MIN)	17.9	Tc (MIN)	22.3	Tc (MIN)	15.0	Tc (MIN)	21.7
FLOW LENGTH (FT)	651	FLOW LENGTH (FT)	802	FLOW LENGTH (FT)	541	FLOW LENGTH (FT)	805
SLOPE (%)	6.6	SLOPE (%)	4.0	SLOPE (%)	7.6	SLOPE (%)	4.4
Q100 (CFS)	3.6	Q100 (CFS)	6.1	Q100 (CFS)	7.4	Q100 (CFS)	7.8

Appendix 4 – Hydraulic Calculations

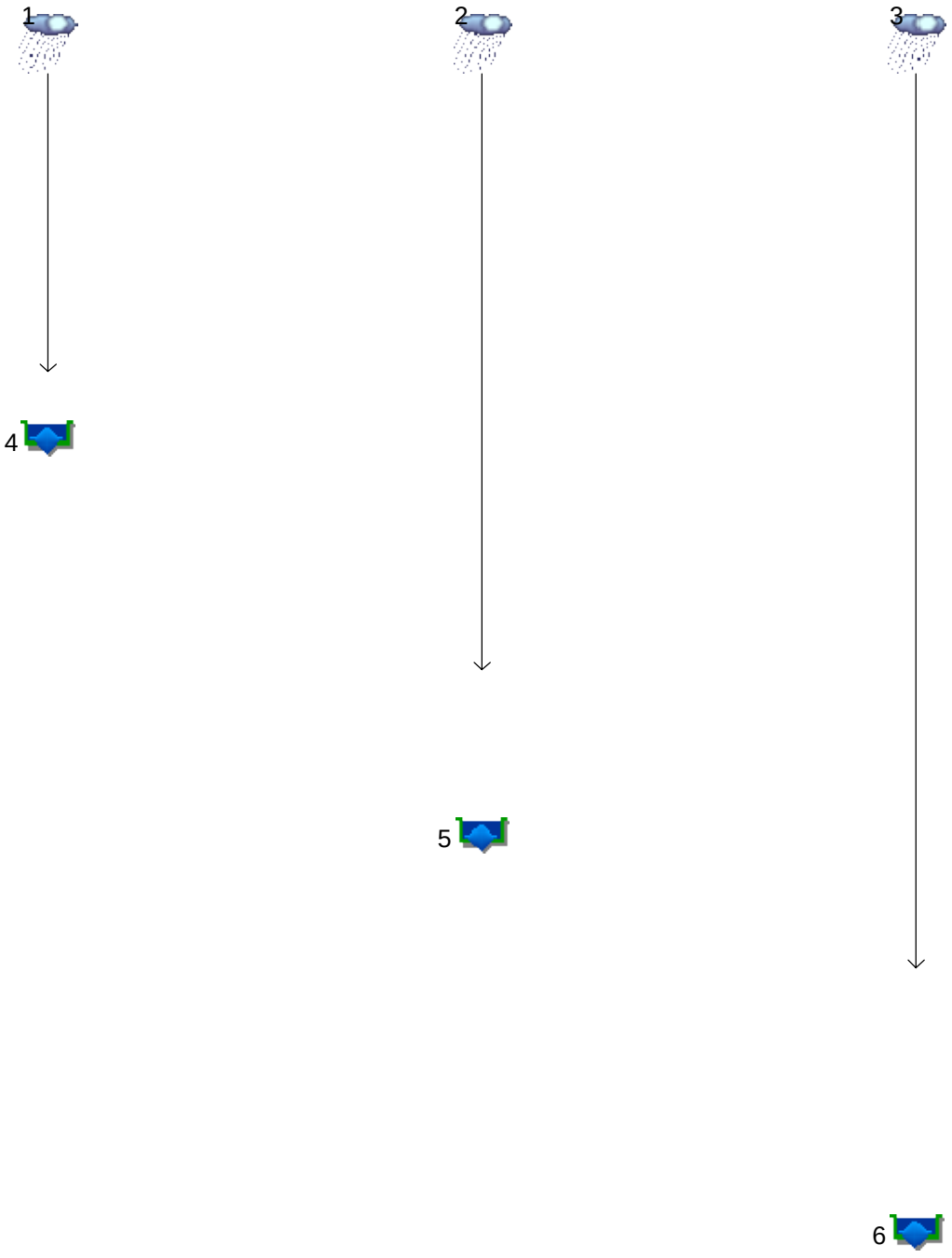
Hydraflow Table of Contents

0905-HH.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v8 Monday, Mar 21, 2011

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v8



Legend

Hyd.	Origin	Description
1	Manual	AREA 2
2	Manual	AREA 3
3	Manual	AREA 4
4	Reservoir	FLOW FROM BASIN 2
5	Reservoir	RUNOFF FROM BASIN 3
6	Reservoir	RUNOFF FROM BASIN 4

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Manual	------	-------	0.000	-------	-------	0.000	-------	-------	6.100	AREA 2
2	Manual	------	-------	0.000	-------	-------	0.000	-------	-------	7.400	AREA 3
3	Manual	------	-------	0.000	-------	-------	0.000	-------	-------	7.800	AREA 4
4	Reservoir	1	-------	0.000	-------	-------	0.000	-------	-------	0.014	FLOW FROM BASIN 2
5	Reservoir	2	-------	0.000	-------	-------	0.000	-------	-------	0.000	RUNOFF FROM BASIN 3
6	Reservoir	3	-------	0.000	-------	-------	0.000	-------	-------	0.000	RUNOFF FROM BASIN 4

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2011 by Autodesk, Inc. v8

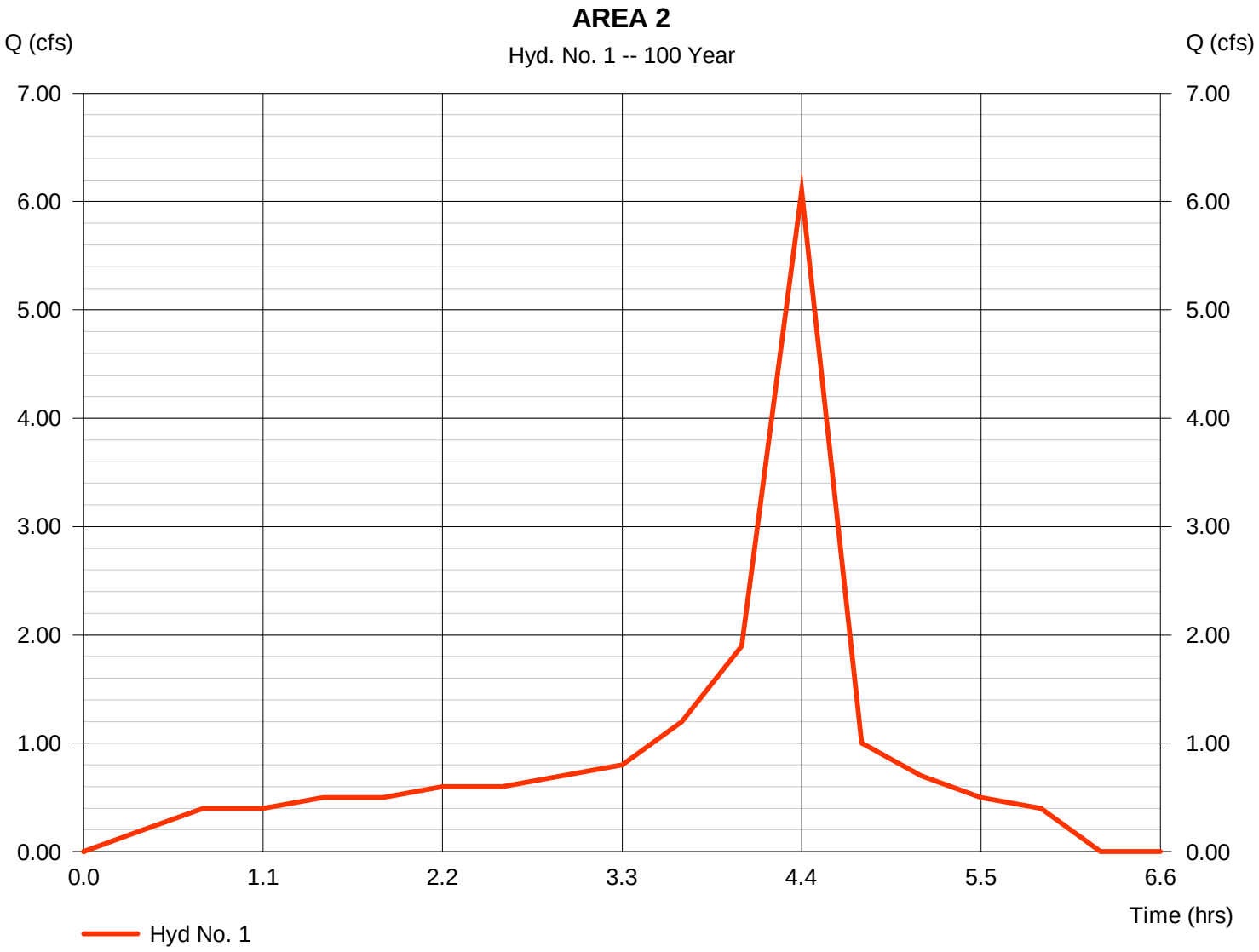
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	6.100	22	264	21,780	------	------	------	AREA 2
2	Manual	7.400	15	255	20,520	------	------	------	AREA 3
3	Manual	7.800	22	264	26,664	------	------	------	AREA 4
4	Reservoir	0.014	22	374	340	1	102.53	21,766	FLOW FROM BASIN 2
5	Reservoir	0.000	15	n/a	0	2	103.60	20,520	RUNOFF FROM BASIN 3
6	Reservoir	0.000	22	n/a	0	3	102.80	26,664	RUNOFF FROM BASIN 4

Hydrograph Report

Hyd. No. 1

AREA 2

Hydrograph type	= Manual	Peak discharge	= 6.100 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.40 hrs
Time interval	= 22 min	Hyd. volume	= 21,780 cuft

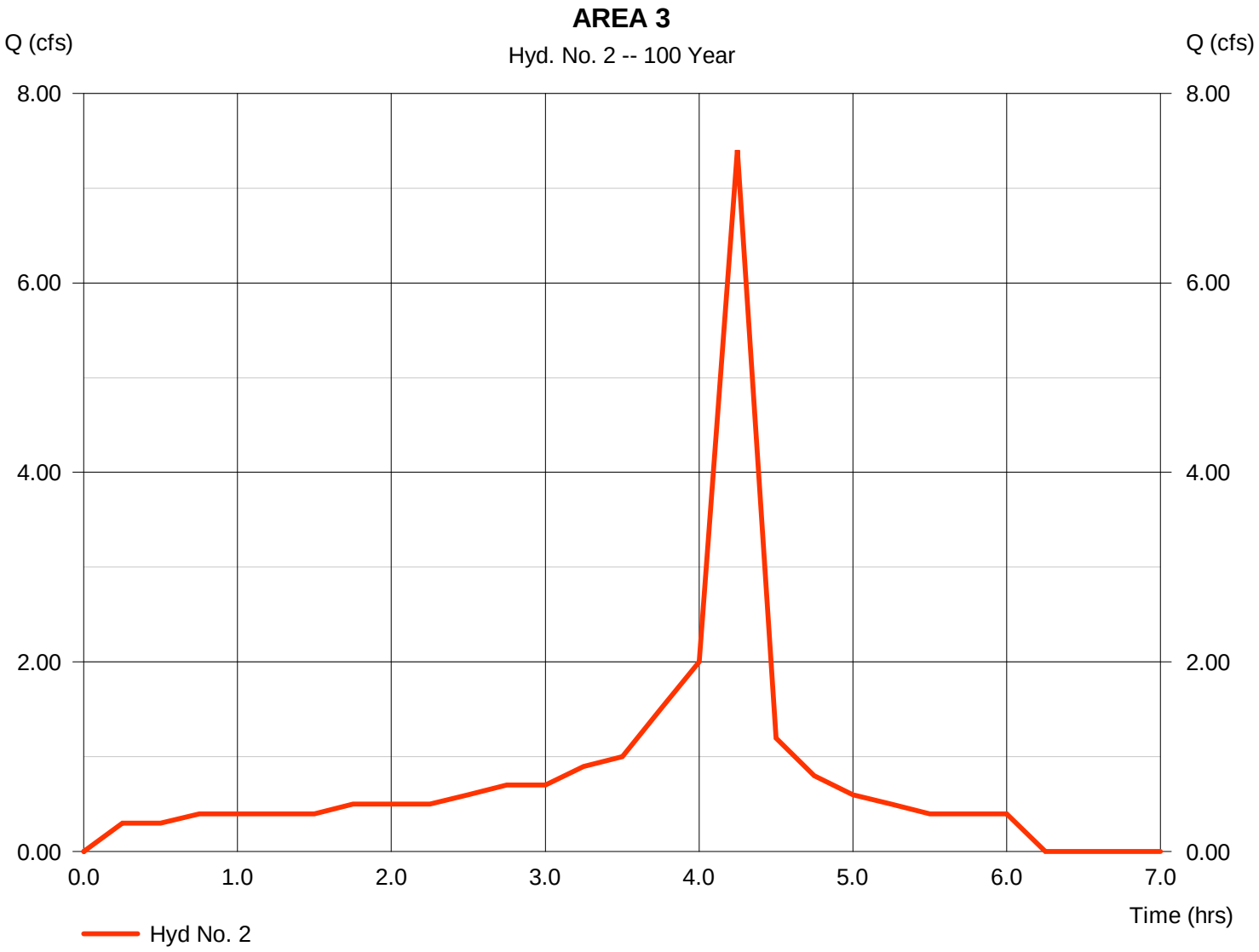


Hydrograph Report

Hyd. No. 2

AREA 3

Hydrograph type	= Manual	Peak discharge	= 7.400 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.25 hrs
Time interval	= 15 min	Hyd. volume	= 20,520 cuft

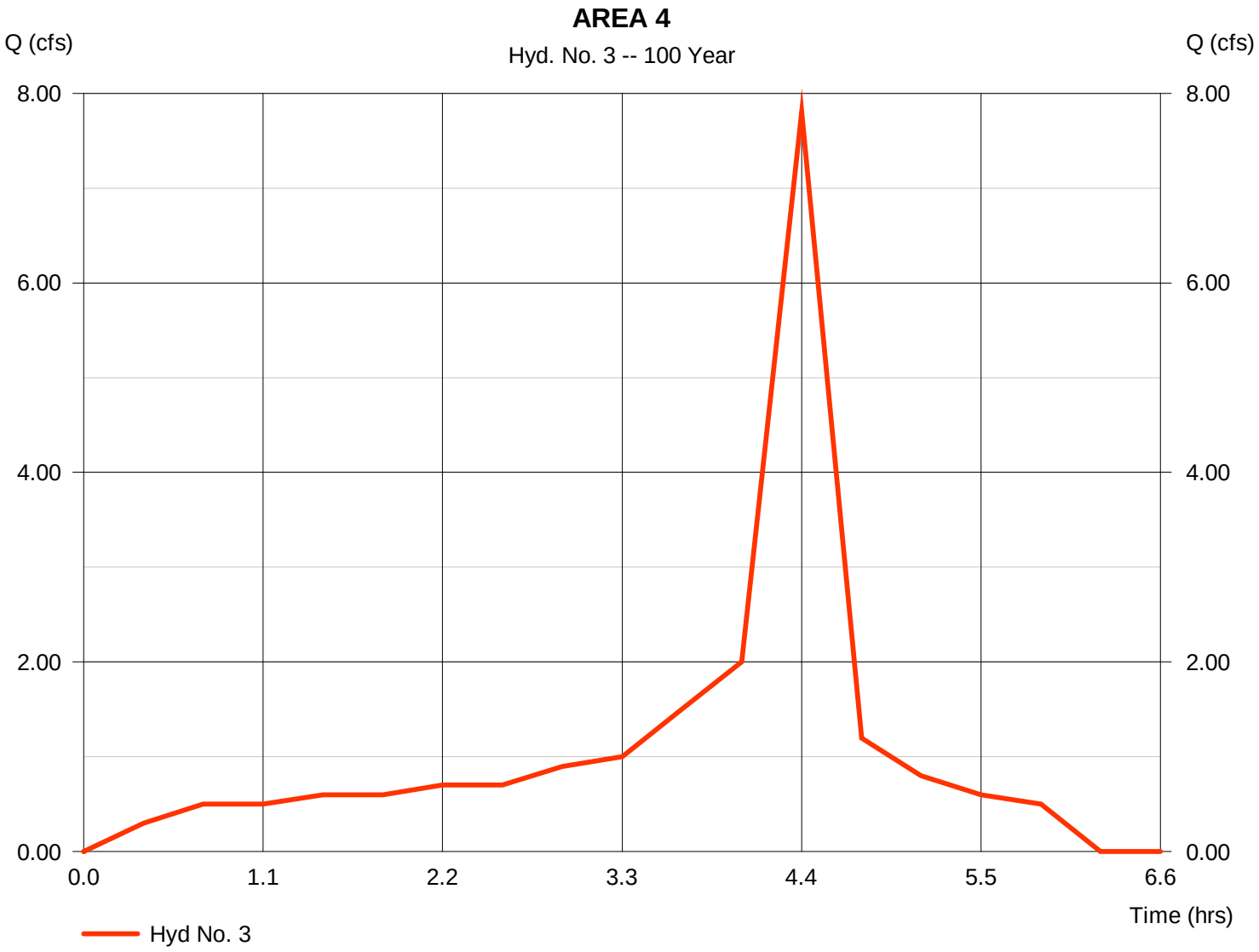


Hydrograph Report

Hyd. No. 3

AREA 4

Hydrograph type	= Manual	Peak discharge	= 7.800 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.40 hrs
Time interval	= 22 min	Hyd. volume	= 26,664 cuft



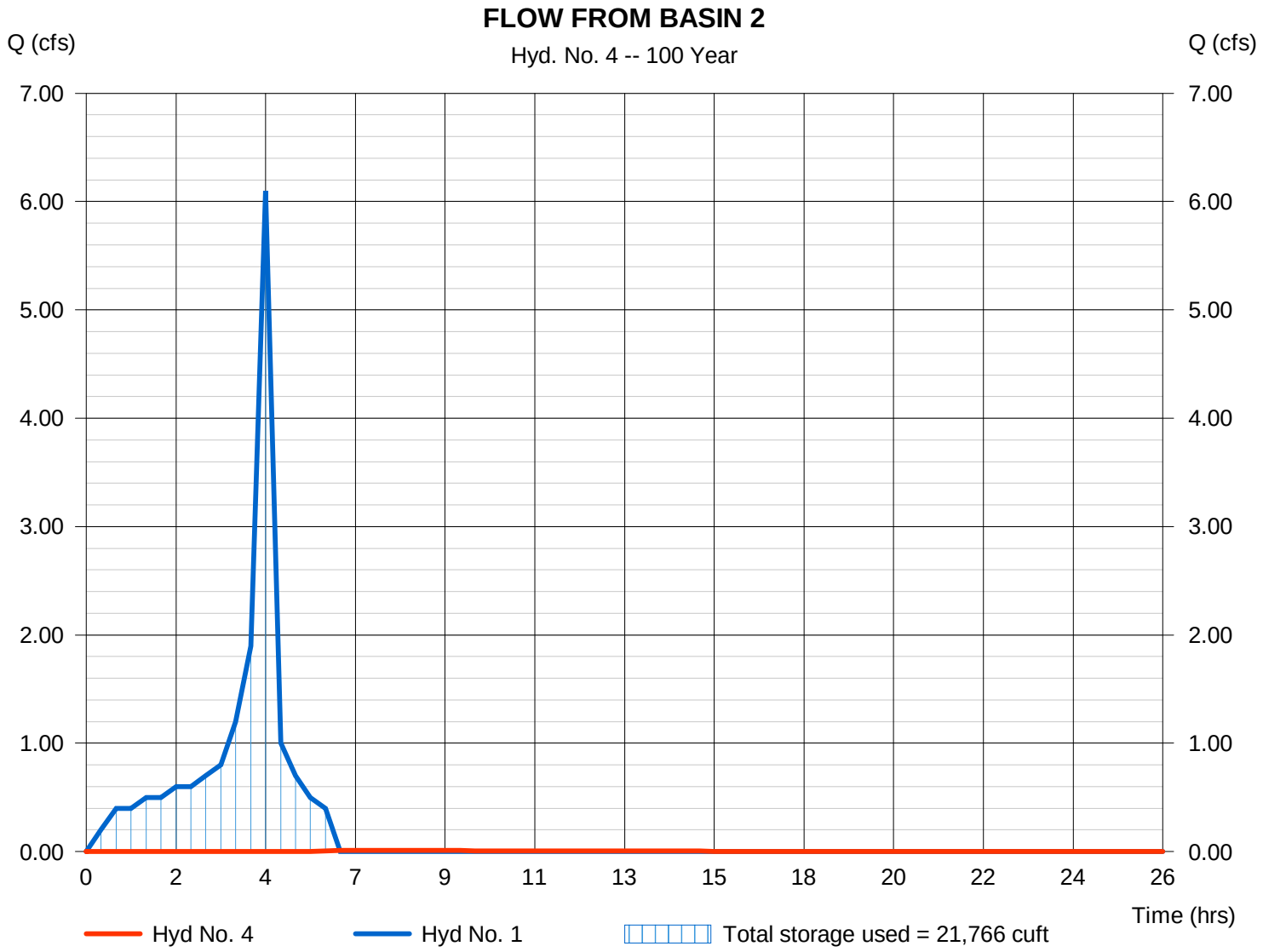
Hydrograph Report

Hyd. No. 4

FLOW FROM BASIN 2

Hydrograph type	=	Reservoir	Peak discharge	=	0.014 cfs
Storm frequency	=	100 yrs	Time to peak	=	6.23 hrs
Time interval	=	22 min	Hyd. volume	=	340 cuft
Inflow hyd. No.	=	1 - AREA 2	Max. Elevation	=	102.53 ft
Reservoir name	=	BASIN 2	Max. Storage	=	21,766 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - BASIN 2

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	6,354	0	0
1.00	101.00	8,034	7,177	7,177
2.00	102.00	9,771	8,887	16,064
3.00	103.00	11,656	10,699	26,763

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 1.00	0.00	0.00	0.00
Span (in)	= 1.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 100.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.60	0.00	0.00	0.00
Crest El. (ft)	= 102.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	7,177	101.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.00	16,064	102.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.00	26,763	103.00	0.05 ic	---	---	---	0.03 s	---	---	---	---	---	0.030

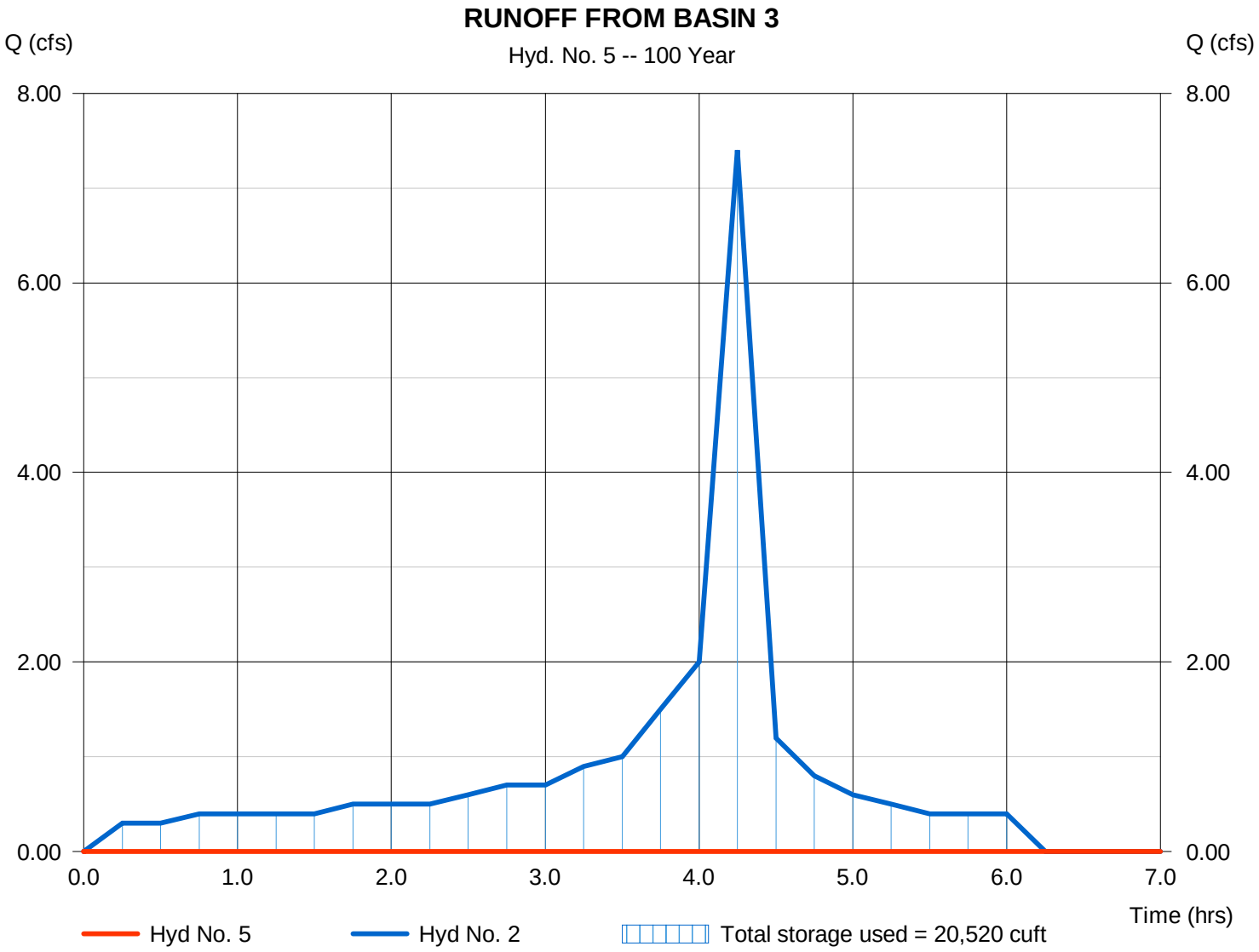
Hydrograph Report

Hyd. No. 5

RUNOFF FROM BASIN 3

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= n/a
Time interval	= 15 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - AREA 3	Max. Elevation	= 103.60 ft
Reservoir name	= BASIN 3	Max. Storage	= 20,520 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - BASIN 3

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	4,050	0	0
1.00	101.00	4,896	4,466	4,466
2.00	102.00	5,814	5,348	9,814
3.00	103.00	6,804	6,302	16,116
4.00	104.00	7,866	7,328	23,444
5.00	105.00	9,000	8,426	31,869

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.50	0.00	0.00	0.00
Span (in)	= 0.50	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 100.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.00	0.00	0.00	0.00
Crest El. (ft)	= 104.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	4,466	101.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.00	9,814	102.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.00	16,116	103.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.00	23,444	104.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.00	31,869	105.00	0.01 ic	---	---	---	0.00	---	---	---	---	---	0.015

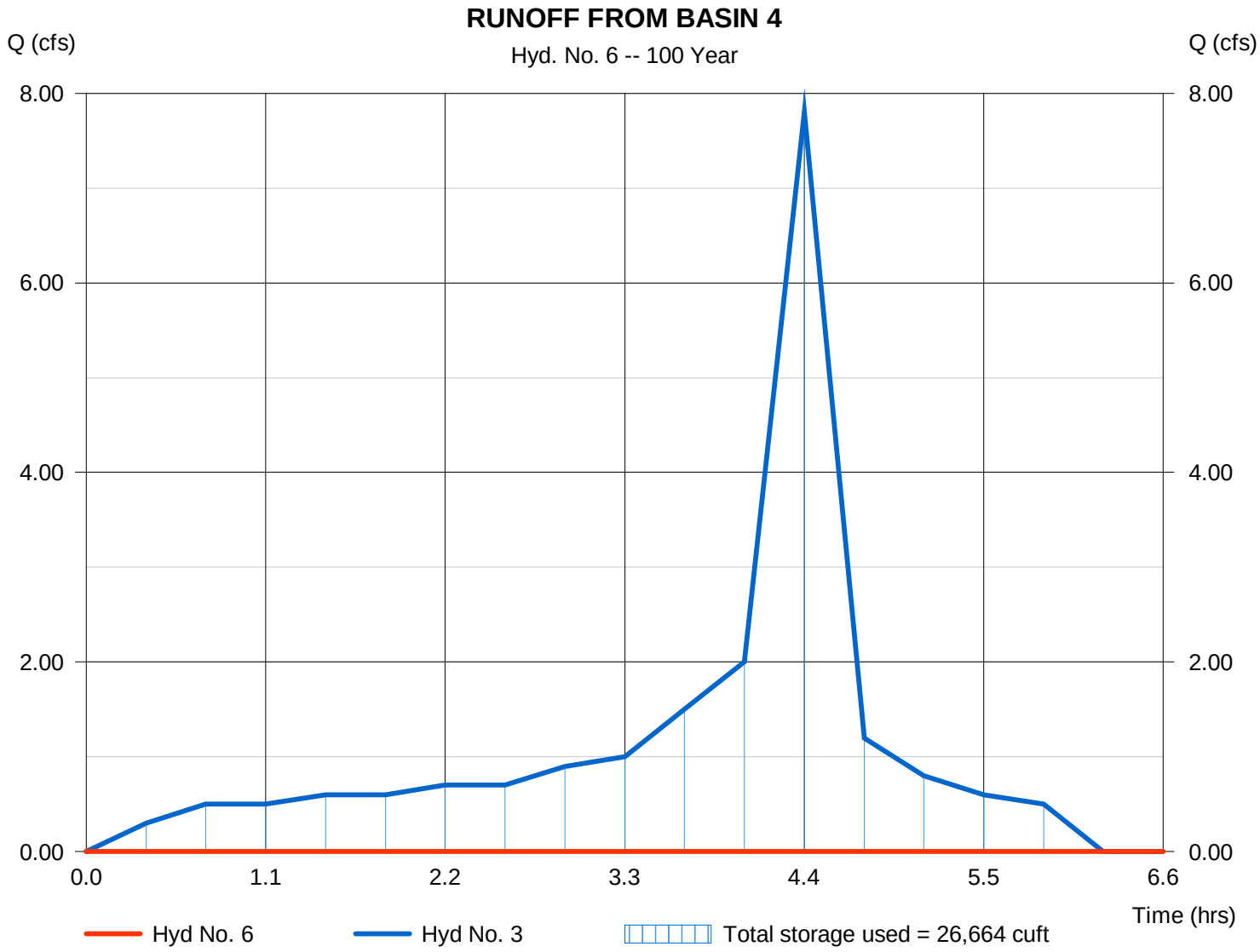
Hydrograph Report

Hyd. No. 6

RUNOFF FROM BASIN 4

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	100 yrs	Time to peak	=	n/a
Time interval	=	22 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	3 - AREA 4	Max. Elevation	=	102.80 ft
Reservoir name	=	BASIN 4	Max. Storage	=	26,664 cuft

Storage Indication method used.



Pond Report

Pond No. 3 - BASIN 4

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 100.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	6,567	0	0
1.00	101.00	8,630	7,574	7,574
2.00	102.00	10,749	9,669	17,243
3.00	103.00	12,925	11,819	29,063
4.00	104.00	15,157	14,025	43,087

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 1.00	0.00	0.00	0.00
Span (in)	= 1.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 100.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.60	0.00	0.00	0.00
Crest El. (ft)	= 103.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	7,574	101.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.00	17,243	102.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.00	29,063	103.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.00	43,087	104.00	0.05 ic	---	---	---	0.03 s	---	---	---	---	---	0.030